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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/639,163	08/16/2000	Kaori Tai	32011-165642	3981

7590 04/24/2002

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EXAMINER

COLEMAN, WILLIAM D

ART UNIT PAPER NUMBER

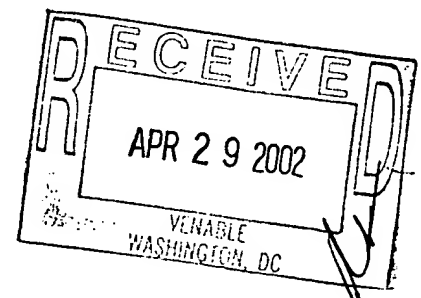
2823

DATE MAILED: 04/24/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

DOCKETED

CLIENT/MATTER # 32011-165642 ATTY JRB
DUE DATE July 24, 2002 (Response to 1st A.A. dep)
FINAL DEADLINE October 24, 2002
DKTED BY Dev / BN



Office Action Summary

Application No.

09/639,163

Applicant(s)

TAI, KAORI

Examiner

W. David Coleman

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 January 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 17 and 18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 24 January 2002 is: a) ☐ approved b) ☒ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Drawings

1. Applicant's newly submitted drawing proposals are not acceptable. The term "Prior Art" label should be listed under each figure.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 4, 5 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants admitted prior art in view of Derderian et al., U.S. Patent 6,245,191.

3. Applicant's admitted prior art discloses a semiconductor method substantially as claimed.

Pertaining to claims 1 and 8, Applicant's admitted prior art teaches a method of producing semiconductor devices by cobalt silicide technology with titanium nitride film as the cap film, comprising:

removing titanium nitride film 112 using a ammonium-hydrogen peroxide-water mixture (see disclosure page 3, lines 17-19). However, Applicants admitted prior art fails to omit the ammonium in the etching step. Derderian teaches removing a titanium nitride film comprising a 30% hydrogen peroxide solution in water (column 4, lines 40-50). In view of Derderian, it would have been obvious to one of ordinary skill in the art to use only a hydrogen-peroxide and water mixture in Applicant's admitted prior art because characteristic parameters of the etching

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solution droplet include the chemical potential, such as surface tension, chemical reactant and reaction product boundary layers within the etching solution (column 4, lines 25-49).

4. Pertaining to claims 4 and 5, Applicant's admitted prior art teaches a method of producing semiconductor devices, comprising:

forming cobalt film 110 on the top surface of a silicon substrate 100, which has a gate electrode 108 and a diffusion layer 102;

forming titanium nitride 112 as the cap film on the top surface of cobalt film 110;

selectively reacting the silicon of silicon substrate 100 and the cobalt film 110; and

removing titanium nitride film 112 using ammonium hydrogen peroxide-water mixture (see disclosure, page 3, lines 17-19). However, Applicants admitted prior art teaches fails to omit the ammonium in the etching step. Derderian teaches removing a titanium nitride film comprising a 30% hydrogen peroxide solution in water (column 4, lines 40-50). In view of Derderian, it would have been obvious to one of ordinary skill in the art to use only a hydrogen-peroxide and water mixture in Applicant's admitted prior art because under ideal conditions, a bead of etching solution droplet would react completely with film 20 with all available etchant within etching solution droplet and contact angle *theta* would remain substantially orthogonal to the plane of film being etched (column 5, lines 44-47).

5. Claims 2, 3, 6, 7, 10, 11, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art in view of Derderian et al., U.S. Patent 6,245,191 B1 as applied to claims 1, 4, 5 and 8 above, and further in view of the following comments.

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6. Pertaining to claims 2, 3, 6, 7, 10, 11, 14 and 15, Applicants admitted prior art discloses a semiconductor process substantially as claimed as discussed above. Given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved. See *In re Aller, Lacey and Hall* (10 USPQ 233-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986)

Appellants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. *Ex parte Ishizaka*, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

Claims 9, 12, 13 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art FIGS. 3A-3E in view of Jang, U.S. Patent 6,051,496.

7. Applicants admitted prior art discloses a semiconductor process substantially as claimed as discussed above. Applicant's admitted prior art teaches forming cobalt film 110 on the top surface of a silicon substrate 100, which has a gate electrode 108 and a diffusion layer 102;

forming titanium nitride **112** as the cap film on the top surface of cobalt film **110**;
selectively reacting the silicon of silicon substrate **100** and the cobalt film **110**; and
removing titanium nitride film **112** using a hydrogen peroxide-water mixture (see
disclosure, page 3, lines 17-19). However, Applicant's admitted prior art fails to disclose a
second portion of the titanium nitride film remaining after the first removal step. Jang teaches a
removing a second portion of said titanium nitride film as claimed by Applicant. See **FIGS. 3A-3C** where Jang teaches a first removal step of removing a first portion titanium nitride **200**, and a
second removal step of removing said titanium nitride film of a second portion **210**. In view of
Jang, it would have been obvious to one of ordinary skill in the art to incorporate the second
removal step of titanium nitride film in Applicant's admitted prior art because during the short
time the first CMP is performed, the polishing action is more local in that the polishing pad does
not reach all the way down to the lower regions (column 6, lines 60-64).

Claim Rejections - 35 USC § 112

8. Claims 9-16 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The process of "removing a first portion of said titanium nitride film by a first removal step using an ammonia-hydrogen peroxide-water mixture such that a second portion of said titanium film remains; and removing said second portion of". The terms underlined in claims 9, 12, 13 and 16 were not taught in the disclosure.

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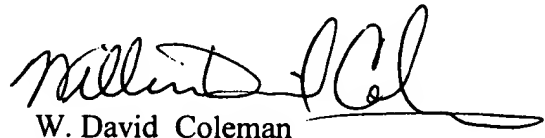
Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to W. David Coleman whose telephone number is 703-305-0004.

The examiner can normally be reached on 9:00 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on 703-308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7721 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

A handwritten signature in black ink, appearing to read 'W. David Coleman', with a long horizontal flourish extending to the right.

W. David Coleman
Examiner
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WDC
April 19, 2002